

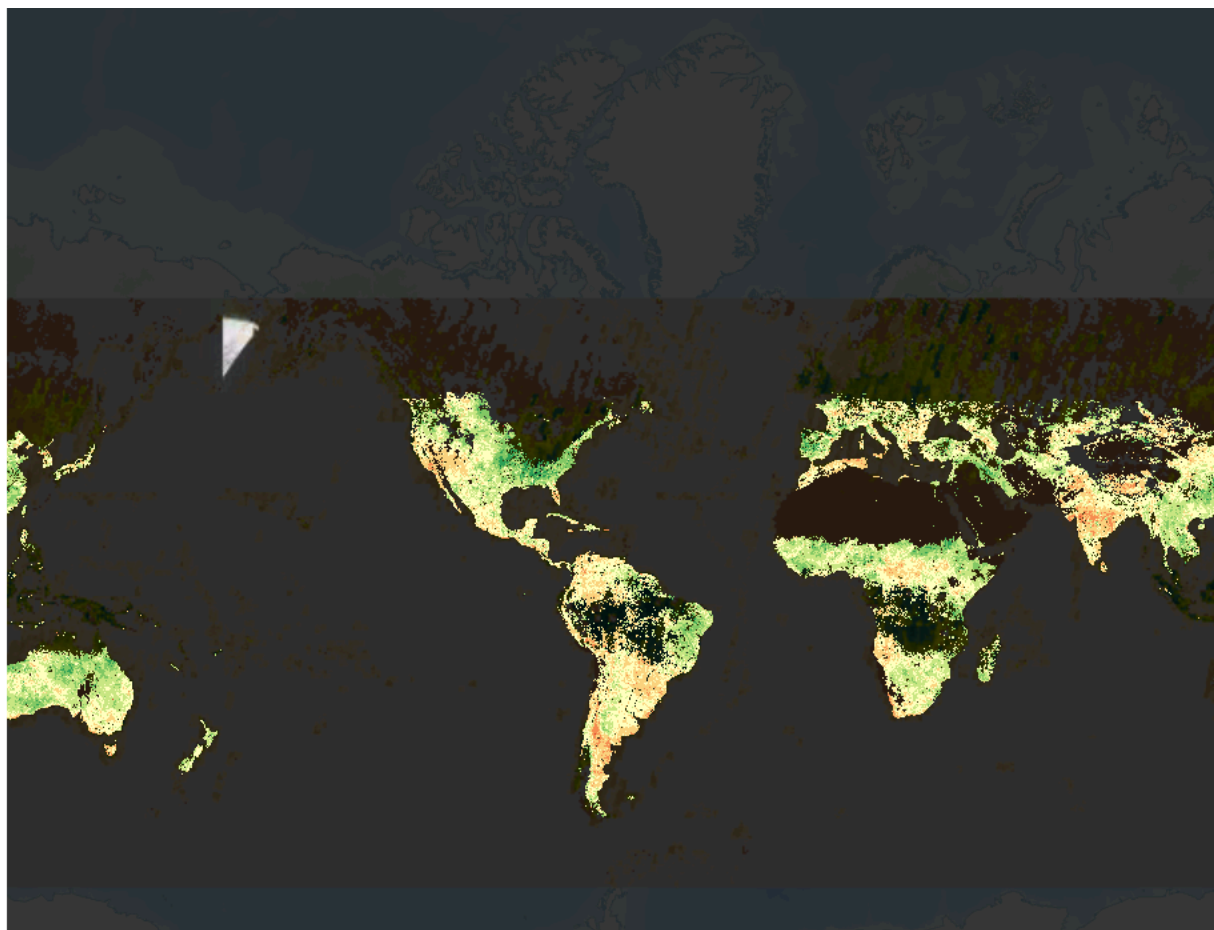


Droughts in 2025: A Global Challenge

Exploring Four Major Drought Events Using GIS

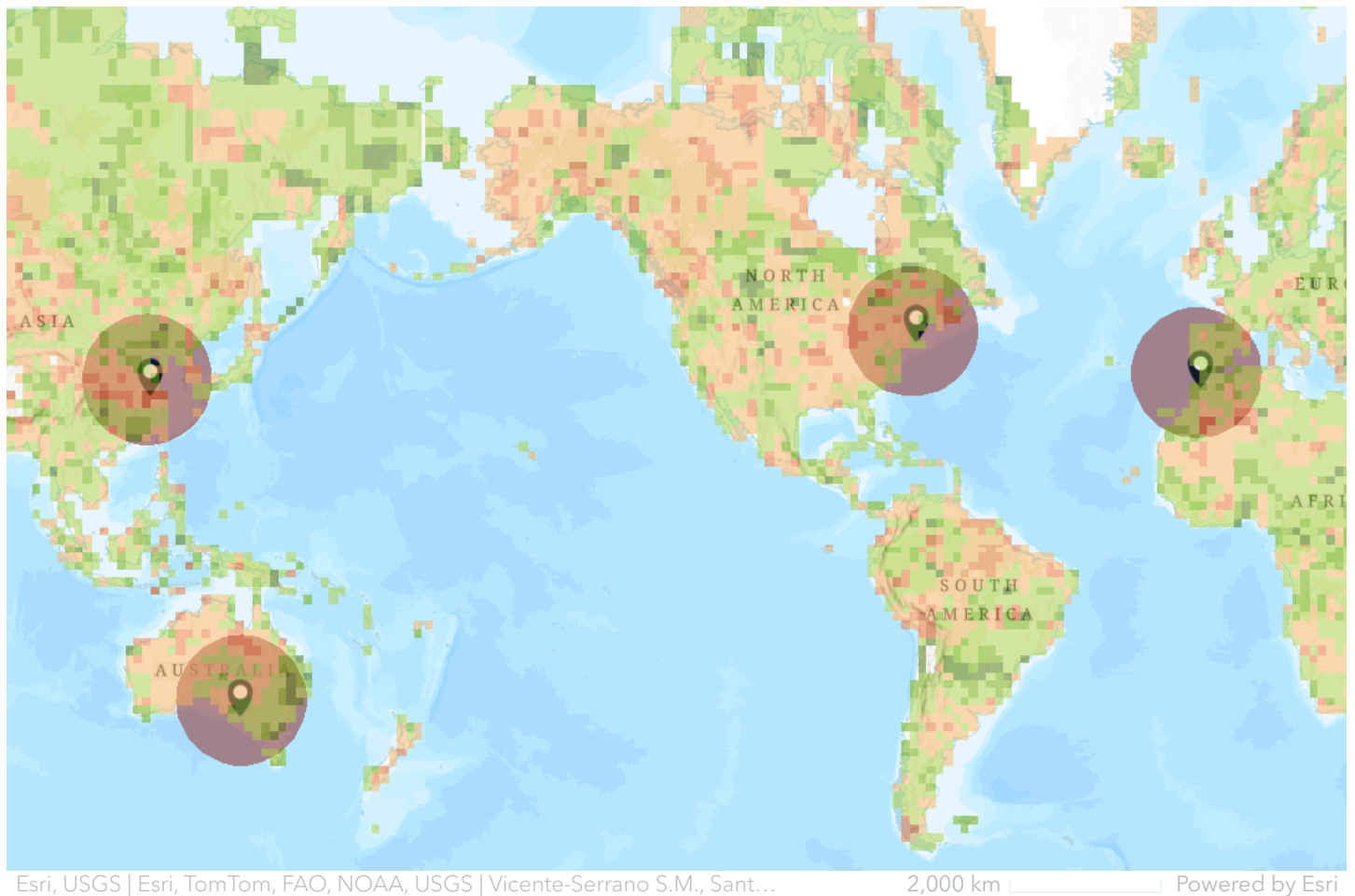
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In 2025, several regions around the world have experienced significant drought conditions, highlighting the urgent need for improved monitoring and response strategies. This StoryMap explores four major drought events that occurred this year, examining their causes, impacts, and the role of geospatial technologies in drought mitigation.

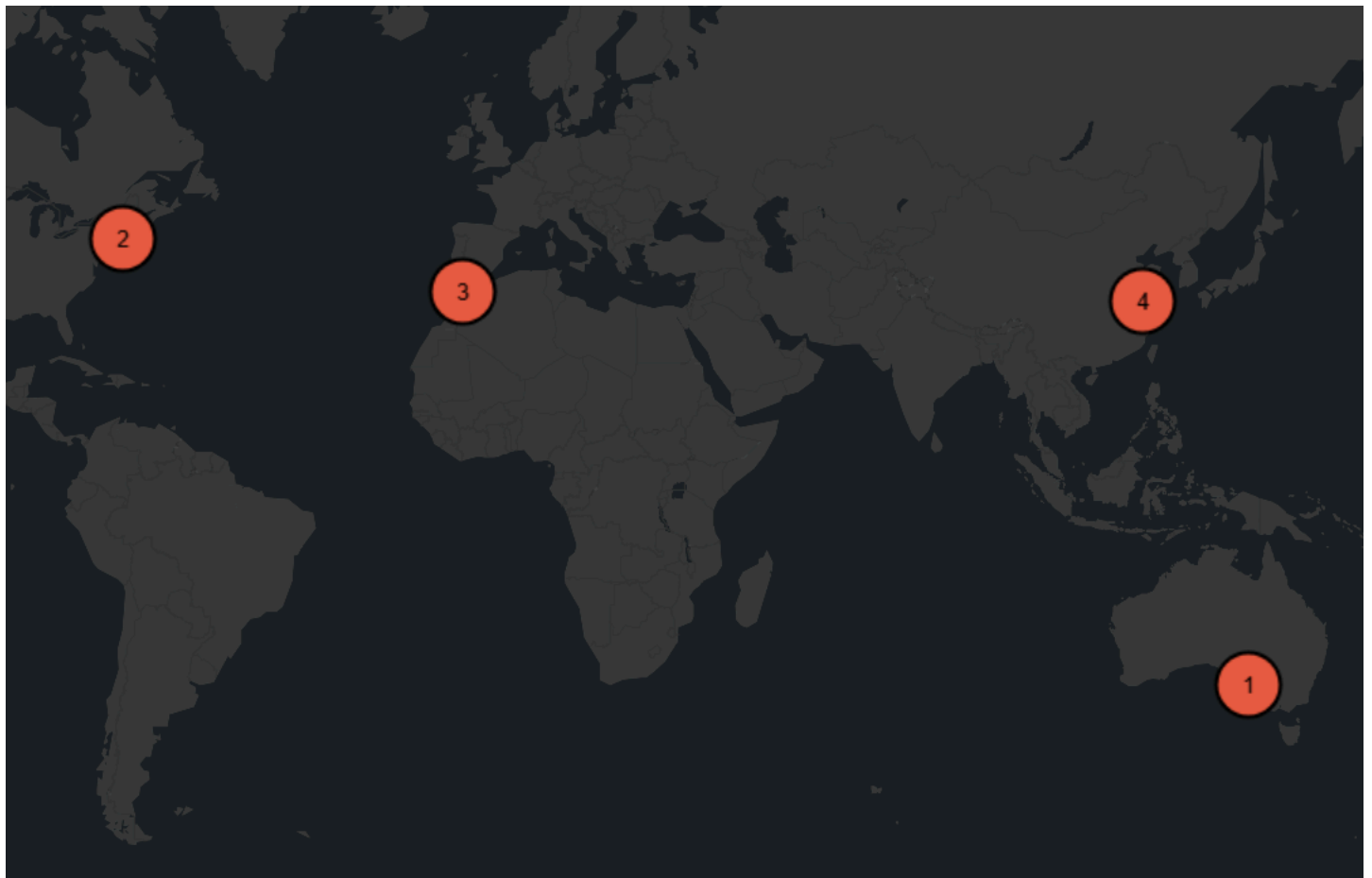
Drought is one of the most persistent and devastating natural disasters, affecting millions of people worldwide each year. Unlike hurricanes or earthquakes, droughts develop slowly, often taking months or even years to reach crisis levels. Their impacts extend beyond immediate water shortages, causing severe consequences for agriculture, ecosystems, and economies.



This map provides a global overview of four significant drought events that occurred in early 2025. Each point represents a region currently experiencing critical water shortages due to prolonged dry conditions, declining precipitation, or altered hydrological cycles. The selected events highlight the geographic diversity of drought impacts—from island ecosystems in the United States to agricultural crises in North Africa, urban water stress in Australia,

and hydrological disruption in one of Asia's most important river systems.

Using geographic coordinates and location-based data, this map situates each event spatially to emphasize the global nature of drought as a hazard. It serves as the foundation for deeper analysis throughout this StoryMap, where each case will be explored in detail through geospatial visualizations, response assessments, and policy implications.



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1 Severe Drought in South Australia

South Australia is currently experiencing one of its most severe droughts in decades, leading to significant water shortages for residents and substantial challenges for the agricultural sector. The drought has resulted in depleted water supplies, affecting daily life and farming operations across the region.

2 Drought on Martha's Vineyard

As of February 10, 2025, state environmental officials have elevated the Cape and Islands region, including Martha's Vineyard, to a Level 2 (significant) drought status. This decision follows a reported precipitation deficit of 3.8 to 6 inches over the past month, leading to deteriorated streamflow and groundwater levels.

3

Drought in Morocco: Impact on Livestock and Agriculture

Morocco is enduring its sixth consecutive year of drought, leading to severe repercussions for its agricultural sector, particularly livestock farming. The prolonged dry conditions have resulted in a 38% reduction in cattle and sheep populations compared to nine years ago. This decline is primarily due to diminished rainfall and depleted pasturelands, essential for sustaining livestock.

4

Hydrological Drought in the Lower Yangtze River, China

Recent studies have highlighted a significant hydrological drought affecting the lower reaches of the Yangtze River (LYR) in China. This drought is attributed to a combination of climate change and human activities, leading to uncertainties in water resource security in the region.

Drought Conditions on Martha's Vineyard



Geospatial Analysis:

Geospatial technologies, such as satellite imagery and Geographic Information Systems (GIS), are instrumental in monitoring the spatial extent and severity of drought conditions on Martha's Vineyard. These tools facilitate the analysis of precipitation patterns, soil moisture levels, and vegetation health, providing critical data for assessing the drought's impact on the island's ecosystems and water resources.

Human Response:

1. Positive Measures:

- **Water Conservation Initiatives:** State officials recommend that residents minimize overall water usage and promptly repair indoor leaks to mitigate the drought's effects. For larger buildings and businesses, conducting water audits is advised to identify leaks and opportunities for water conservation.
- **Community Engagement:** Public awareness campaigns are being implemented to educate residents about the importance of water conservation and the current drought status, fostering a community-wide effort to address the water shortage.

Challenges Faced:

- **Resource Management:** The significant precipitation deficit has strained local water supplies, challenging the sustainability of water resources for both residential and agricultural needs.
- **Environmental Stress:** The prolonged drought conditions have adversely affected local ecosystems, leading to stressed vegetation and increased vulnerability to wildfires.

Role of Geospatial Technology:

- **Drought Monitoring:** Geospatial tools enable continuous monitoring of environmental variables, such as precipitation and soil moisture, aiding in the early detection of drought conditions.
- **Resource Allocation:** GIS facilitates the identification of areas most affected by the drought, allowing for targeted water conservation measures and efficient resource distribution.
- **Public Communication:** Visualizations generated through geospatial analyses can effectively communicate drought severity to the public, enhancing awareness and encouraging proactive conservation behaviors.

In conclusion, the integration of geospatial technology is vital for effective drought management on Martha's Vineyard. By providing detailed insights into environmental conditions and facilitating informed decision-making, these tools support the development of strategies to mitigate the drought's impact on both human communities and the island's ecosystems.

Hydrological Drought in the Yangtze River, China



Impact on Water Resources:

- **Decreased Runoff:** The LYR has experienced a reduction in annual runoff, exacerbating water scarcity issues.
- **Altered Hydrological Patterns:** Changes in precipitation and temperature have disrupted traditional hydrological cycles, affecting water availability.

Impact on Agriculture:

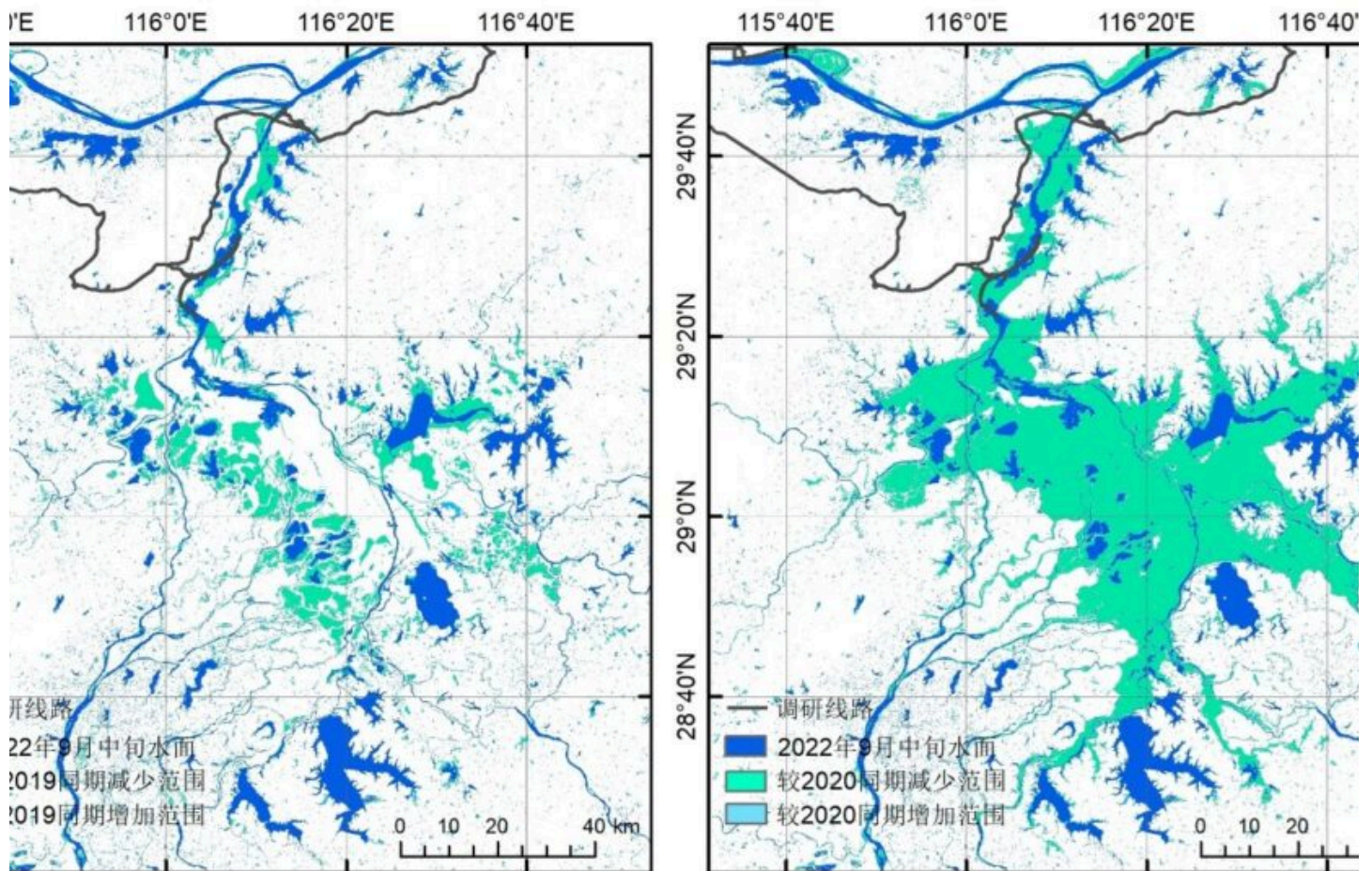
- **Crop Yields:** Reduced water availability has led to decreased yields in staple crops such as wheat and rice, threatening food

security.

- **Irrigation Challenges:** Farmers face difficulties in maintaining adequate irrigation, impacting crop health and productivity.

Government and Community Response:

- **Policy Initiatives:** The Chinese government has prioritized enhancing flood and drought control systems, including strengthening monitoring and forecasting capabilities.
- **Infrastructure Projects:** Large-scale projects, such as the Central Yunnan Water Diversion Project, aim to alleviate water shortages by diverting water to drought-prone regions.



Assessment of Human Response:

- Positive Aspects:
 - Proactive Planning: Implementation of infrastructure projects demonstrates foresight in addressing water scarcity.
 - Technological Integration: Enhanced monitoring and forecasting systems improve response efficiency.
- Areas for Improvement:
 - Environmental Concerns: Large infrastructure projects may have ecological impacts that require careful management.
 - Community Engagement: Increased involvement of local communities in decision-making processes could enhance the effectiveness of response strategies.



Role of Geospatial Technology:

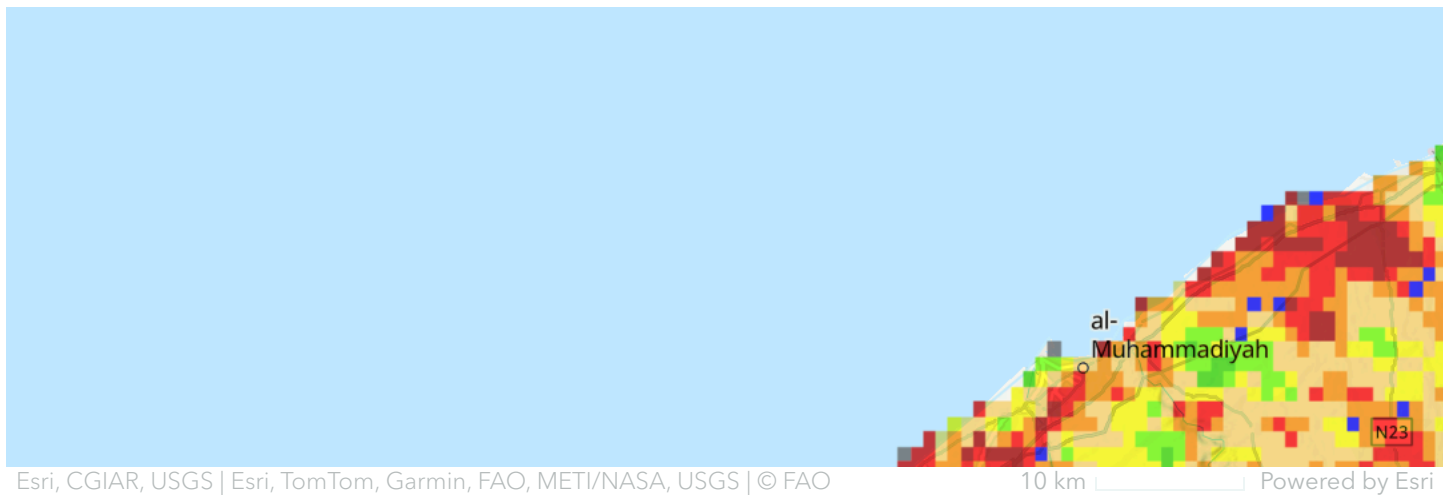
Geospatial technology plays a crucial role in addressing hydrological droughts:

- **Monitoring:** Remote sensing and GIS tools enable real-time tracking of water levels and drought progression.
- **Planning:** Spatial analysis assists in identifying vulnerable areas and planning infrastructure projects.
- **Public Awareness:** Interactive maps and data visualization tools inform the public and stakeholders about drought conditions and response measures.

**Conclusion:**

The hydrological drought in the lower Yangtze River underscores the need for integrated water resource management strategies. Combining infrastructure development with advanced geospatial technologies and community engagement can enhance resilience against future droughts.

Drought in Morocco: Impact on Livestock and Agriculture



Geospatial Analysis:

Utilizing satellite imagery and Geographic Information Systems (GIS), the extent of drought-affected areas in Morocco can be visualized. These tools reveal significant reductions in vegetation cover, especially in regions like Doukala and Souss-Massa, where dam water levels have plummeted to 2% and 15% capacity, respectively. The national dam filling rate has decreased to 26%, indicating a critical water shortage.

Human Response:

1. Positive Measures:

- **Policy Interventions:** The Moroccan government has suspended import duties and value-added tax on cattle, sheep, camels, and red meat to stabilize domestic meat prices. This fiscal policy aims to alleviate the economic burden on consumers and support food security.
 - **Importation Efforts:** To compensate for domestic shortages, Morocco has imported 124,000 sheep, 21,000 cattle, and 704 tons of red meat this year, ensuring a continuous supply of animal protein to the market.
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2. Challenges Faced:

- **Water Resource Management:** The prioritization of drinking water supply over agricultural irrigation has led to insufficient water for crop cultivation and livestock, exacerbating the decline in agricultural productivity.
- **Economic Impact:** The agricultural sector has suffered mass job losses due to the drought, affecting livelihoods and increasing

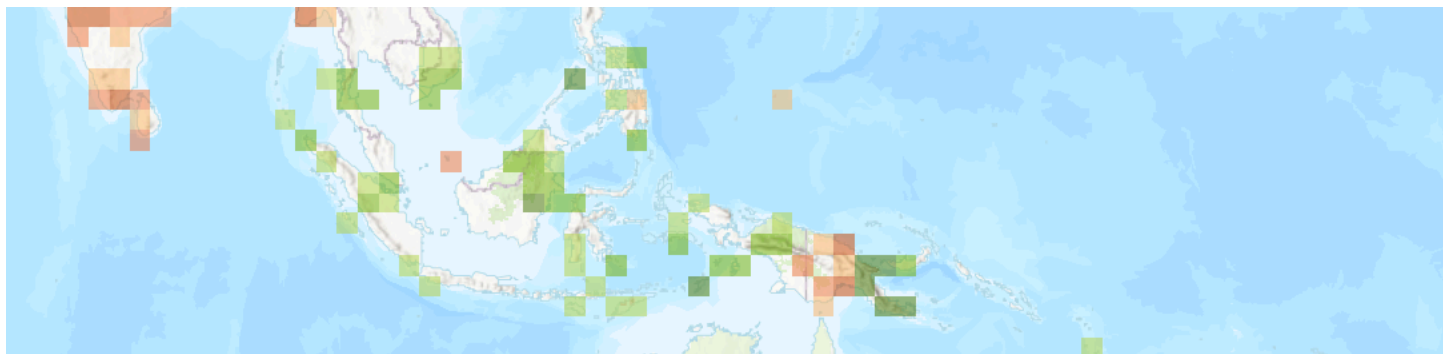
unemployment rates in rural areas.

3. Role of Geospatial Technology:

- **Drought Monitoring:** Geospatial tools enable continuous monitoring of rainfall patterns and soil moisture levels, facilitating early warning systems for drought conditions.
- **Resource Allocation:** GIS aids in identifying regions most affected by drought, allowing for targeted distribution of resources such as water and feed to support livestock and farming communities.
- **Policy Planning:** Spatial analysis assists policymakers in designing effective drought mitigation strategies, including the development of desalination projects and improved water management practices.

In conclusion, the integration of geospatial technology is crucial in addressing the challenges posed by consecutive droughts in Morocco. By providing detailed insights into environmental conditions and resource distribution, these tools support informed decision-making and effective response strategies to mitigate the adverse effects on agriculture and livestock.

Severe Drought in South Australia



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Impact on Residents:

Many households in the Adelaide Hills and Fleurieu Peninsula rely on rainwater tanks, which have run dry due to prolonged low rainfall. This scarcity has led to extensive delays in water deliveries, with some residents waiting up to three months. Consequently, basic activities such as drinking, cooking, and sanitation have been severely disrupted. Some residents have had to temporarily relocate due to the lack of water.

Impact on Agriculture:

Farmers are facing unprecedented challenges, struggling to maintain livestock and crops without adequate water. Many have

resorted to destocking and purchasing water and hay at elevated prices, further straining their finances. The region's vineyards, particularly in the Barossa Valley, are also suffering due to deficient winter rains and increased frost risks.

Government and Community Response:

The South Australian government has initiated emergency measures, including establishing temporary bulk water collection points staffed by SA Water, operating daily from 7 am to 7 pm. These points are intended solely for domestic use to support residents whose water tanks have run dry. The government is also planning additional support for water carters, such as deploying extra trucks and expediting the entry of new water carriers. Despite these efforts, there is criticism regarding the adequacy of the response, with calls for more comprehensive solutions to address the drought's impact across various regions.

- Positive Aspects:

- The establishment of emergency water collection points has provided immediate relief to affected households.
- Community initiatives, such as local sporting clubs offering shower facilities and neighbors sharing water resources, have fostered solidarity and support.

- Areas for Improvement:

- The water carting industry is overwhelmed, leading to significant delays in water deliveries.
- There is a need for more sustainable, long-term solutions to address recurring drought conditions, including infrastructure investments and policy reforms.

Role of Geospatial Technology:

Geospatial technology can play a pivotal role in enhancing drought response efforts:

- **Monitoring and Early Warning:** Satellite imagery and remote sensing can detect changes in soil moisture and vegetation health, providing early warnings of drought conditions.
- **Resource Allocation:** Geospatial data can assist in identifying the most affected areas, enabling targeted distribution of water resources and aid.
- **Public Awareness:** Interactive maps and dashboards can inform the public about water availability, restrictions, and support services, promoting efficient water use and community engagement.

The four drought events highlighted in this StoryMap—occurring across the United States, Morocco, Australia, and China—demonstrate the growing global scale and complexity of drought-related hazards in 2025. Despite differing geographic and socioeconomic contexts, each region experienced severe environmental, agricultural, and human security consequences due to prolonged water scarcity.

A common thread across all case studies is the increasing importance of geospatial technology in drought monitoring, response, and communication. Remote sensing, satellite data, and GIS platforms facilitated early warning, enabled targeted intervention, and supported public engagement in each case. Whether tracking dam levels in Morocco, managing emergency water distribution in South Australia, or visualizing hydrological stress in China's Yangtze River, geospatial tools proved indispensable to modern disaster management.

However, these events also reveal ongoing challenges: gaps in infrastructure resilience, inequities in resource access, and the ecological trade-offs of large-scale interventions. Moving forward,

more integrated strategies—combining technological innovation with local participation and long-term sustainability planning—will be essential to build adaptive capacity and protect vulnerable communities.

References:

MV Times. (2025, February 10). *Island now in significant drought*. Retrieved from <https://www.mvtimes.com/2025/02/10/island-now-significant-drought/>

Reuters. (2025, February 13). *Morocco's livestock hit by consecutive droughts, agriculture minister says*. Retrieved from <https://www.reuters.com/world/africa/moroccos-livestock-hit-by-consecutive-droughts-agriculture-minister-says-2025-02-13/>

The Guardian. (2025, March 2). *Low rainfall in the Adelaide Hills has left thousands on the brink*. Retrieved from <https://www.theguardian.com/australia-news/2025/mar/02/they-cant-drink-water-they-cant-flush-the-toilet-low-rainfall-in-the-adelaide-hills-has-left-thousands-on-the-brink>

News.com.au. (2025, March 4). *Drought conditions pummel SA farmers, growers, and families*. Retrieved from <https://www.news.com.au/national/south-australia/drought-conditions-pummel-sa-farmers-growers-and-families/news-story/34af158acecffc6a98408aa57ab65e53>

Carbon Brief. (2025, March 6). *China Briefing: Two sessions climate news and water targets missed*. Retrieved from <https://www.carbonbrief.org/china-briefing-6-march-2025-two-sessions-climate-news-new-vice-minister-targets-missed/>

Frontiers in Marine Science. (2025). *Hydrological Changes in the Lower Yangtze River Basin*. Retrieved from <https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2025.1534674/full>